The Analytical Policeman

- The explosion of computerized data affects all parts of society, including law and order.

- In the past, human judgment and experience was the only tool in identifying patterns in criminal behavior.

- Police forces around the US and the world are augmenting human judgment with analytics – sometimes described as “predictive policing”.
Predictive Policing in the News
Example: Los Angeles Police Dept.

“I’m not going to get more money. I’m not going to get more cops. I have to be better at using what I have, and that’s what **predictive policing** is about… If this old street cop can change the way that he thinks about this stuff, then I know that my [officers] can do the same.”

- Los Angeles Police Chief Charlie Beck
Role of Analytics

- The analytical tools you have learned in this class can be used to make these “predictive policing” models.

- However, **communicating** the results of these models is essential – a **linear regression** output table will not be of use to a **policewoman on patrol**.

- Visualization bridges the gap between **the data and mathematics** and the **end user**.
Understanding the Past

• Before we even consider a predictive model, we should try to understand the historical data

• Many cities in the US and around the world provide logs of reported crimes, usually including the time, location, and nature of the event

• We will use data from Chicago about motor vehicle thefts
Crime Over Time

- Suppose we wanted to communicate crime patterns over the course of an average week.
- We could display daily averages using a line graph, but this does not seem like it would be too useful.
Crime Over Time

• We can replace our x-axis with the hour of the day, and have a different line for every day of the week, but this would be a jumbled mess with 7 lines!

• We could use no visualization at all, and instead present the information in a table

• This is valid, but how can we make the table more interesting and usable?

<table>
<thead>
<tr>
<th>Time</th>
<th>MO</th>
<th>TU</th>
<th>WE</th>
<th>TH</th>
</tr>
</thead>
<tbody>
<tr>
<td>03:00</td>
<td>34</td>
<td>32</td>
<td>31</td>
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<td>04:00</td>
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Heatmaps

- **Heatmaps** are a way of visualizing data using three attributes. The **x-axis** and **y-axis** are typically displayed horizontally and vertically.

- The **third attribute** is represented by shades of color. For example, a **low** number might be **blue**, and a **high** number might be **red**.
Heatmaps

- We can pick **different color schemes** based on the **type of data** to convey different messages.

- The x-axis and y-axis don’t need to be continuous – they can be **categorical**.

- We could even combine a heatmap with a **geographical map** – we will discuss this later in the class.
A Chicago Crime Heatmap

- We will use Chicago motor vehicle theft data to explore patterns of crime:
  - Over days of the week
  - Over hours of the day

- We’re interested in the total number of car thefts that occur in any particular hour of a day of the week over the whole data set
Eye on Crime

- Criminal activity-related data often has both components of time and location.
- Sometimes all that is required is a line chart, but heatmaps can visualize data that would be too big for a table.
- Plotting data on maps is much more effective than a table for location based data, and is eye-catching.
Predictive Policing

• Many police forces are exploiting their databases to focus finite resources on problem areas

• Not only do analytics help improve policework, the outputs are also good communication tools to decision makers in government and to the wider public

• The application of analytics to data like this is new and growing, with companies like PredPol and Palantir leading the effort